

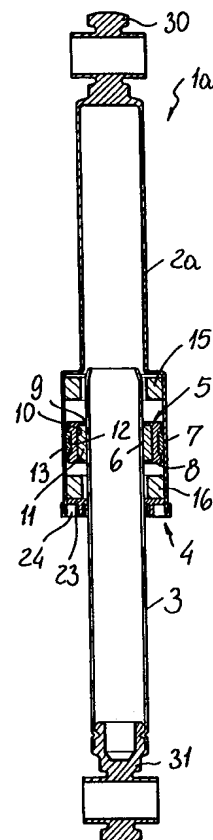


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/IT97/00303 <b>(22) International Filing Date:</b> 9 December 1997 (09.12.97) <b>(30) Priority Data:</b> MI96A002577 9 December 1996 (09.12.96) IT <b>(71) Applicant (for all designated States except US):</b> C.I.M.A. - COMPAGNIA ITALIANA MOLLE ACCIAIO S.P.A. [IT/IT]; Via Piave, 66, I-20040 Busnago (IT). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> FERLICCA, Roberto [IT/IT]; C.I.M.A. - Compagnia Italiana Molle Acciaio S.p.A., Via Piave, 66, I-20040 Busnago (IT). <b>(74) Agent:</b> CICOGNA, Franco; Ufficio Internazionale Brevetti, Dott. Prof. Franco Cicogna, Via Visconti di Modrone, 14/A, I-20122 Milano (IT).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i>

**(54) Title:** FRICTION DAMPER FOR WASHING MACHINES OR THE LIKE**(57) Abstract**

The present invention relates to a friction damper which has been specifically designed for washing machines or the like. The damper (1a, 1b) comprises a hollow shell (2a, 2b, 2c) and a rod (3), coaxially arranged, which form a telescopic construction. The rod (3) is provided with an outer diameter smaller than the inner diameter of the shell (2a, 2b, 2c), and between the shell (2a, 2b, 2c) and the rod (3), guiding means (4) are provided. The damper further comprises a friction damper element (5) arranged between the rod (3) and the shell (2a, 2b, 2c) and having a first working surface which is frictionally slidably coupled to the rod (3) and a second working surface which is frictionally slidably coupled with the shell (2a, 2b, 2c).



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### Description

#### FRICITION DAMPER FOR WASHING MACHINES OR THE LIKE

##### Background of the Invention

The present invention relates to a friction damper which has been specifically designed for washing machines and the like.

5 As is known, the basket of a washing machine is affected, during the rotary movement thereof, by oscillations due to a dynamic unbalancing of the rotary mass of the basket and of the lineN held therein.

Said basket is usually suspended, by springs,  
10 to the washing machine frame and, in order to dampen the above mentioned oscillations or vibrations, two dampers or shock absorbers are conventionally used, each of which is coupled, at the bottom end portion thereof, to the washing machine frame and, at the top  
15 portion thereof, to the basket.

Dampers for a washing machine application comprise friction dampers, which are substantially constituted of a shell, having a substantially cylindrical shape, inside of which a rod is adapted to  
20 slide, between the rod and shell being arranged a gasket made of a friction material, said gasket being rigidly coupled to the shell or to the rod.

This gasket is designed for providing a friction braking operation in order to brake the mutual  
25 displacement of the rod with respect to the shell.

While the above mentioned dampers have been found to provide an efficient damping of the basket oscillations in washing machines, they, however, generate a comparatively high friction rubbing during

the washing machine washing steps thereby causing the basket to oscillate, even if in a comparatively small degree. Consequently, the dampers are quickly worn out, in particular at the region thereof which is engaged  
5 with the friction material gasket, thereby quickly reducing the operating efficiency of this gasket which must be frequently replaced.

### Summary of the Invention

10 Accordingly, the aim of the present invention is to overcome the above mentioned problem, by providing a friction damper, specifically designed for washing machines or the like, which is adapted to differentially operate depending on the washing machine  
15 operating steps, i.e. depending on the amplitude of the washing machine basket oscillations, so as to provide a greater damping as said oscillation amplitude is great.

Within the scope of the above mentioned aim, a main object of the present invention is to provide  
20 such a friction damper which has an operating life much greater than that of conventional friction damper, by reducing, during the normal operating steps of the washing machine, i.e. as the washing machine basket is affected by small amplitude oscillations, the friction  
25 energy dissipation.

Another object of the present invention is to provide a friction damper which is very simple construction wise and which can be made at a competitive cost.

30 A further object of the present invention is to provide such a friction damper which is very reliable and safe in operation.

According to one aspect of the present

invention, the above mentioned aim and objects, as well as yet other objects, which will become apparent hereinafter, are achieved by a friction damper, specifically designed for washing machines or the like, comprising a hollow shell and a rod coaxially arranged with respect to one another and forming a telescopic motion construction, said rod having an outer diameter less than an inner diameter of said shell and, between said shell and rod, rod guiding means being arranged, characterized in that said damper further comprises a friction damper element, arranged between said rod and shell and including a first working surface frictionally slidably coupled to said rod and a second working surface frictionally slidably coupled to said shell.

#### **Brief Description of the Drawings**

Further characteristics and advantages of the friction damper according to the present invention will become more apparent hereinafter from the following disclosure of some preferred, though not exclusive, embodiments of the friction damper which are illustrated, by way of a merely indicative, but not limitative, example in the figures of the accompanying drawings, where:

Figure 1 is an axial cross-sectional view illustrating a first embodiment of the friction damper according to the present invention;

Figure 2 illustrates an enlarged detail of Figure 1;

Figure 3 is an axial cross-sectional view illustrating a second embodiment of the friction damper;

Figure 4 illustrates and enlarged detail of Figure 3;

Figure 5 is an axial cross-sectional view illustrating a third embodiment of the friction damper according to the invention;

Figure 6 illustrates an enlarged detail of Figure 5;

Figure 7 illustrates a load diagram of the damper according to the present invention, and clearly shows the variation of the damper load as the pressing thereon and/or extension thereof is varied.

#### **Description of the Preferred Embodiments**

With reference to the number references of the above mentioned figures, the friction damper, according to the present invention, which has been generally indicated, in its three embodiments, by the reference numbers 1a, 1b, 1c, comprises a hollow shell 2a, 2b, 2c and a rod 3, which are coaxially arranged with respect to one another, and form a telescopic motion construction.

The rod 3 is provided with an outer diameter smaller than the inner diameter of the shell 2a, 2b, 2c and between the shell and rod guiding means 4 for guiding said rod 3 are arranged.

The subject friction damper comprises moreover a friction damper element 5, arranged between the rod 3 and shell 2a, 2b, 2c and having a first working surface 6, which is frictionally slidably coupled to the outer surface of the rod 3 and a second working surface 7, which is frictionally slidably coupled to the inner surface of the shell 2a, 2b, 2c.

More specifically, the friction damper

element 5 comprises, in the embodiments thereof herein disclosed, a holding bushing 8, having a substantially cylindrical shape, which is provided with a throughgoing hole 9 for allowing the rod 3 to pass therethrough, said bushing being fitted about said rod 3.

On the inner surface of the holding bushing 8 is provided a holding seat 10 adapted to receive a friction clamp 11, whereas on the outer surface thereof a further holding seat 12 is defined, for receiving a further friction clamp 13, provided for contacting the inner surface of the shell 2a, 2b, 2c.

As shown, the first working surface 6, i.e. the working surface of the friction clamp 11, engaged with the outer surface of the rod 3, provides a friction reaction which is greater than the friction reaction of the second working surface 7, i.e. the working surface of the friction clamp 13, engaged with the inner surface of the shell 2a, 2b, 2c.

The damper element 5 is arranged in a space provided between the rod 3 and shell 2a, 2b, 2c, which is axially delimited by a pair of resilient elements.

As is clearly shown in Figures 1 and 2, said resilient elements can comprise a pair of cup pressing springs, respectively indicated by the reference numbers 15 and 16 and being schematically represented.

As clearly shown in Figures 3 and 4, said resilient elements, which axially delimit the space in which is held the friction damper element 5, can comprise a pair of resiliently compressible pads 18 and 19.

As shown in Figures 5 and 6, said resilient elements can also be constituted by a pair of cup

pressing springs 21 and 22.

In the first embodiment shown in Figures 1 and 2, the shell 2a is provided, at the end portion thereof housing therein the friction damper element 5, with an increased diameter defining a shoulder for the innermost cup pressing spring 15.

The end axial portion of said enlarged part of the shell 2a supports guiding means 4, comprising a guiding bushing 23.

Said guiding bushing 23 is axially locked by a closure disc 24, fitted on the enlarged diameter portion of the shell 2a.

The end of the shell 2a opposite to the enlarged diameter portion thereof, ends with an anchoring head 30, which can be made in a single piece with the shell 2a.

The end of the rod 3 opposite to the end thereof entering the shell 2a, is also coupled to an anchoring head 31.

In the embodiment shown in Figures 3 and 4, the guide means for guiding the rod 3 inside the shell 2b comprise a pair of guide bushings, respectively indicated by the reference numbers 35 and 36.

The guide bushings 35 and 36, thereagainst the pads 18 and 19 abut, are axially locked by inwardly deformed portions of the shell 2b, which can comprise, for example, caulked, upset portions, or portions deformed by any other suitable deforming method.

In this embodiment, the end of the shell 2b opposite to the end thereof therethrough said rod 3 is entrained, is coupled to an anchoring head 37, whereas the end of the rod 3 opposite to the end thereof entering the shell 2b is coupled to an anchoring head



38.

In the embodiment shown in Figures 5 and 6 too, the guide means comprise a pair of guide bushings 40 and 41 defining two opposite bearing surfaces for the cup pressing springs 21 and 22 and which are locked by inwardly deformed portions of the shell 2c, in a like manner to that which has been disclosed with reference to the embodiment shown in Figures 3 and 4.

Even in this case, one end of the shell 2c is coupled to an anchoring head 43, whereas the end of the rod 3 opposite to the end thereof engaged inside the shell 2c is coupled to a respective anchoring head 44.

The friction damper according to the present invention operates as follows.

During a normal operation of the washing machine, i.e. as the washing machine basket is affected by low amplitude oscillations, because of a comparatively high friction existing between the friction damper element 5 and rod 3, the damper element 5 can rigidly axially translate with the rod 3 and, accordingly, a comparatively small friction dissipation will occur only between the friction clamp 13 and inner surface of the shell 2a.

As the washing machine centrifuge is operated, or as said centrifuge is turned off, or as the basket is affected by greater amplitude oscillations, the friction damper element 5 will be driven by the rod 3 against one of the resilient elements comprising the cup springs 15, 16, 21, 22 or the pads 18, 19 and, as a consequence of the above mentioned abutment, or locking, the rod 3 will be caused to slide with respect to the friction clamp 11 which, as mentioned, will provide a friction reaction

greater than that provided by the friction clamp 13.

Thus, the greater amplitude oscillations of the basket will be damped with a greater friction damping.

5           In this connection it should be pointed out that the friction damper element 5 can slide in a cylindric housing the length of which is so designed to prevent said damper element from contacting the cup springs 15, 16, 21 and 22 or the pads 18 and 19 during  
10 a centrifugation step, in the absence of anomalous oscillations.

          From the above disclosure and from the figures of the accompanying drawings, it should be apparent that the invention fully achieves the intended  
15 aim and objects.

          In particular, the fact is to be pointed out that a friction damper has been provided which generates a comparatively small friction reaction as the basket is affected by comparatively small amplitude oscillations,  
20 i.e. during a normal operation of the washing machine, thereby providing a great reduction of the damper wear, as well as a greater friction damping reaction as the basket is affected by comparatively large amplitude oscillations, for example as the washing machine  
25 centrifuge is turned on and off, thereby efficiently damping these oscillations.

          While the invention has been disclosed and illustrated with reference to preferred embodiments thereof, it should be apparent that the disclosed  
30 embodiments are susceptible to many modifications and variations all of which will come within the scope of the appended claims.

**CLAIMS**

1. A friction damper, specifically designed for washing machines or the like, comprising a hollow  
5 shell and a rod coaxially arranged with respect to one another and forming a telescopic motion construction, said rod having an outer diameter less than an inner diameter of said shell and, between said shell and rod, rod guiding means being arranged, characterized in that  
10 said damper further comprises a friction damper element, arranged between said rod and shell and including a first working surface frictionally slidably coupled to said rod and a second working surface frictionally slidably coupled to said shell.

15 2. A friction damper, according to Claim 1, characterized in that said damper element comprises a substantially cylindric holding bushing provided with a throughgoing axial hole and fitted about said rod, on the inner surface and outer surface of said bushing  
20 seats being formed for housing therein friction clamps, frictionally engaging against the outer surface of said rod and the inner surface of said shell.

3. A friction damper, according to Claims 1 and 2, characterized in that said first working surface  
25 provides, due to a coupling with said rod, a friction reaction greater than the friction reaction provided by said second working surface being coupled with said shell.

4. A friction damper, according to one or  
30 more of the preceding claims, characterized in that said damper element is arranged between said rod and shell, in a space axially delimited by a pair of resilient means.

5. A friction damper, according to one or more of the preceding claims, characterized in that said resilient elements comprise a pair of cup springs.

5 6. A friction damper, according to one or more of the preceding claims, characterized in that said resilient elements comprise a pair of resiliently compressible pads.

7. A friction damper, according to one or more of the preceding claims, characterized in that  
10 said guide means comprise at least a guide bushing axially locked inside said shell and therethrough said rod slidably passes.

8. A friction damper, according to one or more of the preceding claims, characterized in that  
15 said guide means comprise a pair of guide bushings, axially locked inside said shell and therethrough said rod slidably passes, said guide bushings being arranged outside of the space axially delimited by said pair of resilient elements.

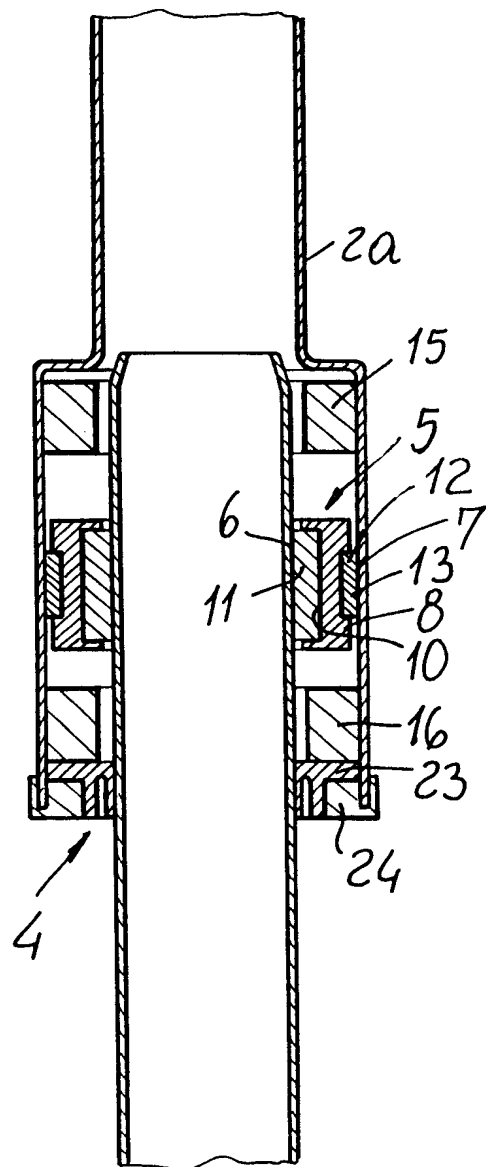
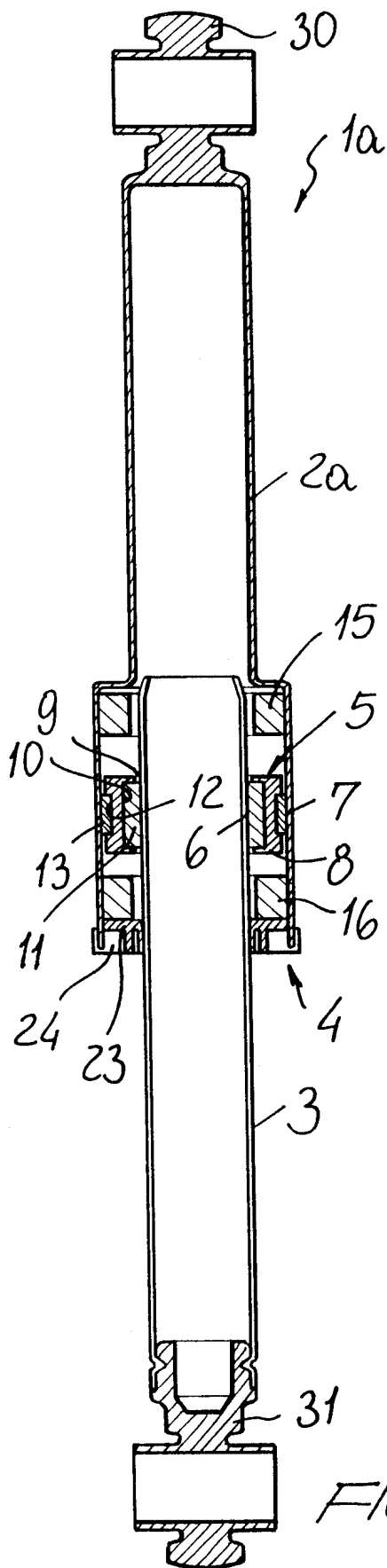
20 9. A friction damper, according to one or more of the preceding claims, characterized in that said guide bushings are axially locked by inwardly deformed regions of said shell.

25 10. A friction damper, according to one or more of the preceding claims, characterized in that the space axially delimited by said pair of resilient elements is defined by an enlarged diameter and region of said shell.

30 11. A friction damper, according to one or more of the preceding claims, characterized in that said friction damper element is adapted to slide in a cylindric housing the length of which is so designed that said damper element is prevented from contacting

said cup springs or pads during a centrifuging operating step, in the absence of anomalous oscillations.

1/4



2/4

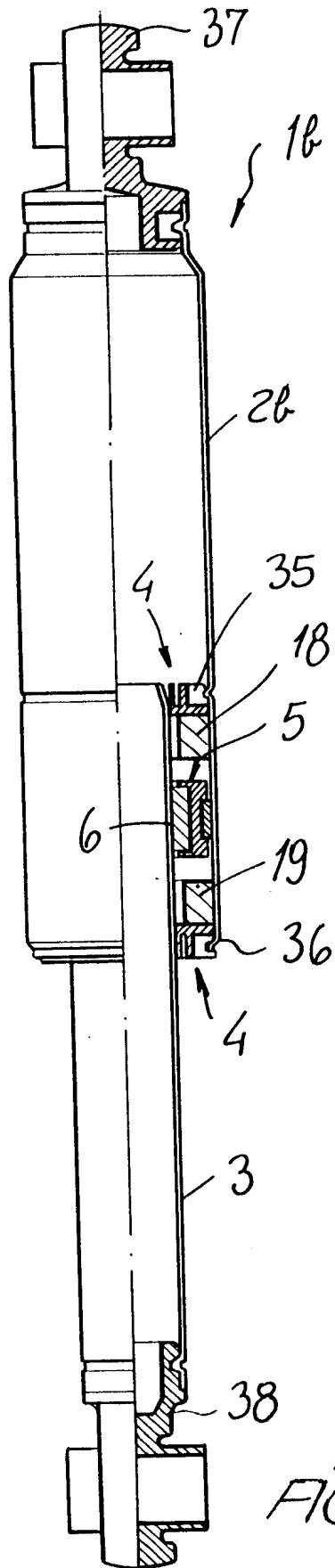


FIG. 3

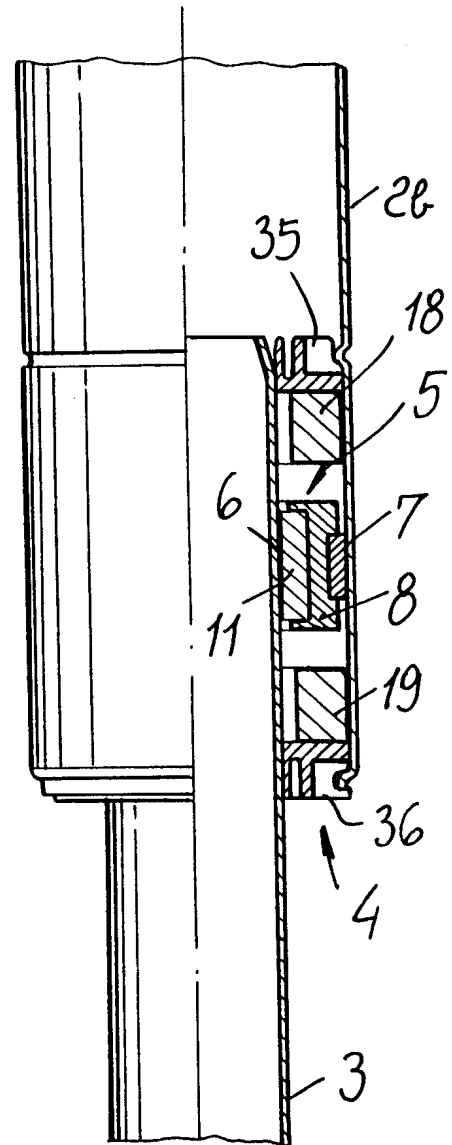
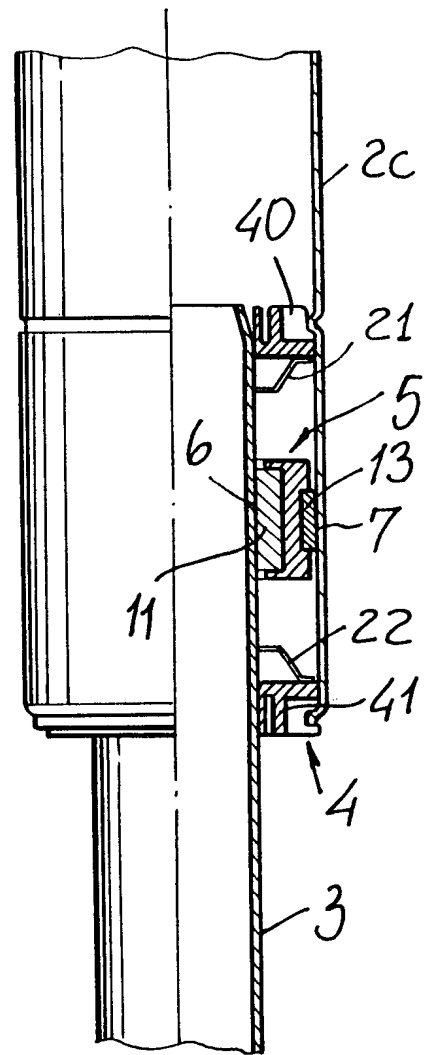
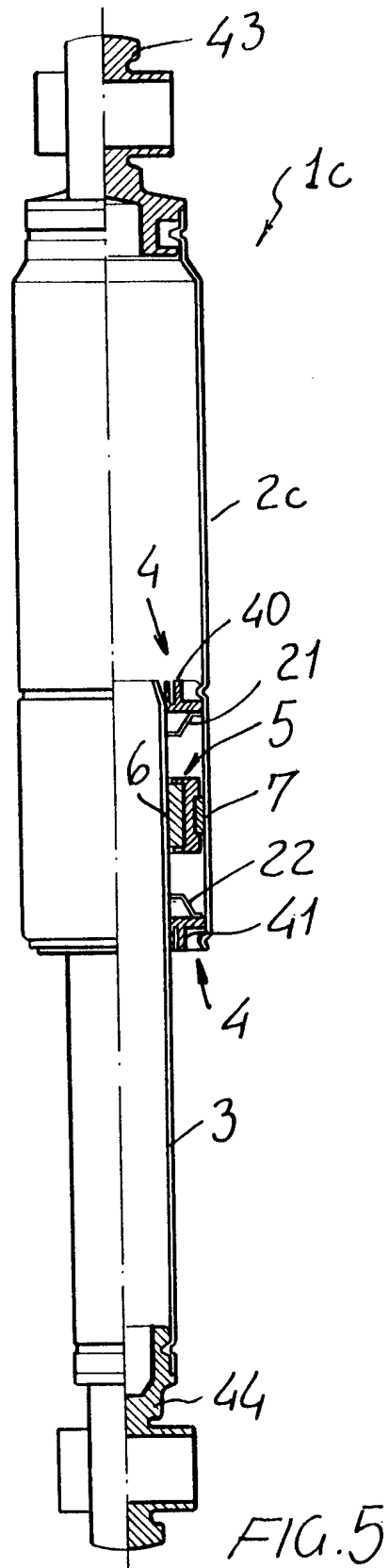


FIG. 4

3/4





4/4

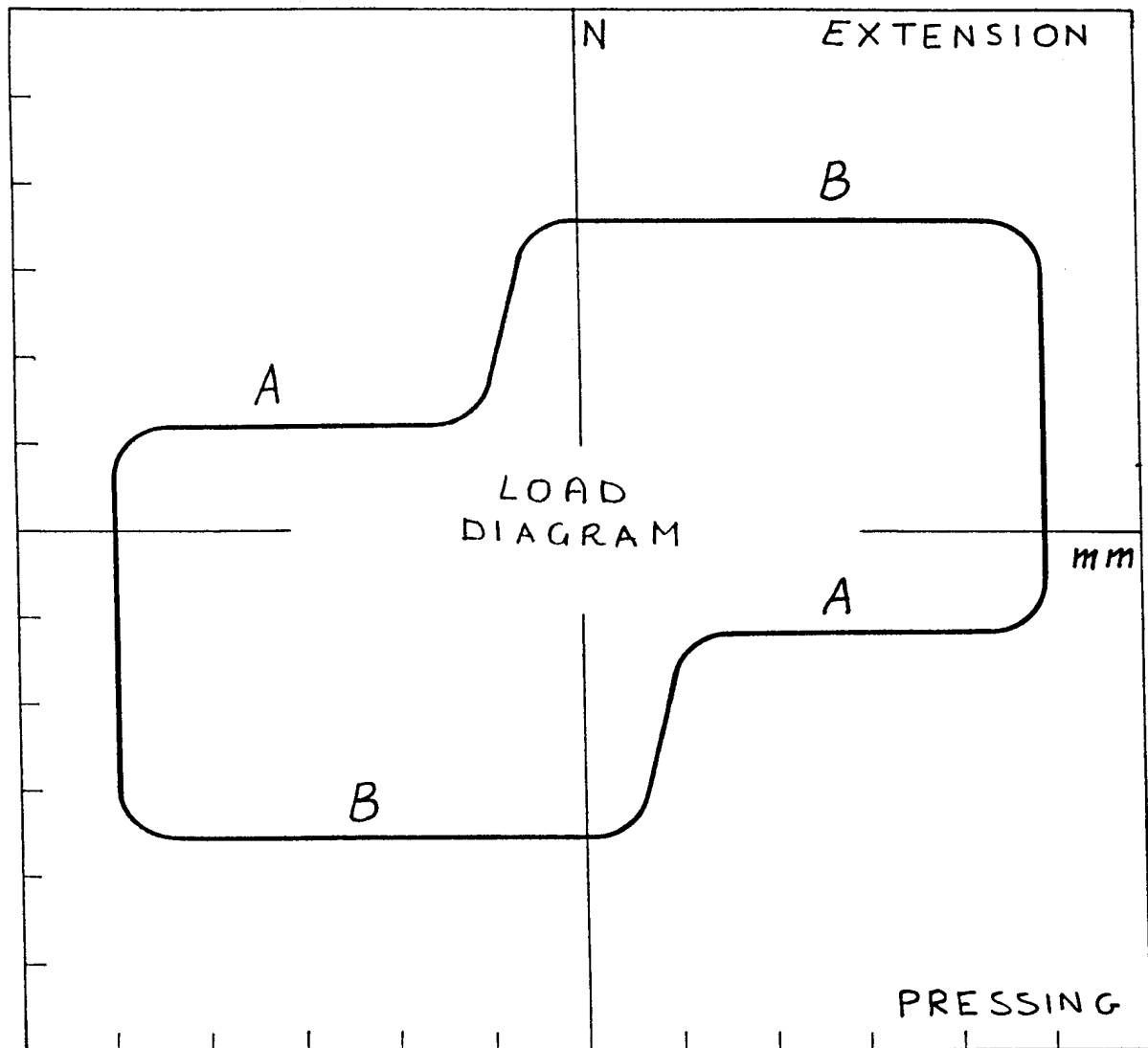


FIG. 7

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/IT 97/00303

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 F16F7/09 D06F37/20

According to International Patent Classification(IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F16F D06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 32 16 152 A (SCHWARZENBERG WASCHGERAETE) 30 December 1982 see page 2, line 4 - page 4, line 33; figures	1,2,4-6
Y		8,9
Y		10
A		3
Y	EP 0 336 176 A (BAUER FRITZ & SOEHNE OHG) 11 October 1989 see claims; figures	8,9
A		1,7,10
P,Y	EP 0 806 514 A (SUSPA COMPART AG) 12 November 1997 see abstract; figures	10
A		1,4

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Date of the actual completion of the international search

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International Application No

PCT/IT 97/00303

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 95 14130 A (ZANUSSI ELETTRODOMESTICI) 26 May 1995 see page 5, line 3 - page 8, line 7; figures	1,2
Y		4-7
Y		8,9
A		3
	---	
Y	GB 2 078 882 A (HOTPOINT LTD) 13 January 1982 see abstract; claims; figures	4-7
A		1
	---	
Y	FR 1 322 985 A (E. SCHAAL) 26 June 1963 see the whole document	8,9
A		1,7,10
	-----	

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IT 97/00303

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3216152 A	30-12-1982	DD 159803 A	06-04-1983
EP 0336176 A	11-10-1989	DE 3811742 A US 4934493 A	19-10-1989 19-06-1990
EP 0806514 A	12-11-1997	DE 19615010 A	23-10-1997
WO 9514130 A	26-05-1995	IT PN930033 U	17-05-1995
GB 2078882 A	13-01-1982	EP 0042708 A	30-12-1981
FR 1322985 A	26-06-1963	NONE	

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LIKE  
**PUBN-DATE:** June 18, 1998

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FERLICCA ROBERTO	IT

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**APPL-DATE:** December 9, 1997

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**EUR-CL (EPC):** D06F037/20 , F16F007/09

**US-CL-CURRENT:** 68/23.1

**ABSTRACT:**

CHG DATE=19990617 STATUS=O>The present invention relates to a friction damper which has been specifically designed for washing machines or the like. The damper (1a, 1b) comprises a hollow shell (2a, 2b, 2c) and a rod (3), coaxially arranged, which form a telescopic construction. The rod (3) is provided with an outer diameter smaller than the inner diameter of the shell (2a, 2b, 2c), and between the shell (2a, 2b, 2c) and the rod (3), guiding means (4) are provided. The damper further comprises a friction damper element (5) arranged between the rod (3) and the shell (2a, 2b, 2c) and having a first working surface which is frictionally slidably coupled to the rod (3) and a second working surface which is

frictionally slidably coupled with the shell (2a, 2b, 2c).